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48. 1968.

PUBLICATIONS

OF THE

Metropolitan Sewage Manure Company.

REPORT

OF

DR. GUY AND MR. SHERBORN,

TO THE

DIRECTORS OF THE METROPOLITAN SEWAGE MANURE COMPANY,

ON THE

Application of Liquid Manure in the Neighbourhood of Manchester, by the Liquid Manure Irrigation Company.

WITH

SUPPLEMENTARY NOTES,

BY DR. MILLER, MR. PHILIP HOLLAND, OF MANCHESTER, &c.

Reprinted, with additions, from No. I. of the "Journal of Public Health."

LONDON:

JAMES RIDGWAY, PICCADILLY:

AND

NISSEN AND PARKER, 43, MARK LANE.

1848.

PRICE TWOPENCE.

ADVERTISEMENT.

THE Directors of the Metropolitan Sewage Manure Company, believing that the subject of the application to Agriculture of the Refuse of Towns is daily increasing in interest and importance, and feeling that the position of the Company as the Pioneer in this great work entitles it to take the lead in diffusing information, have determined to issue a Cheap Series of Publications. Some of them, which have already appeared in print, have been revised and enriched by important additions; others are now published for the first time.

The following are in the course of publication:

1. Report of Dr. GUY and Mr. SHERBORN to the Directors of the Metropolitan Sewage Manure Company, on the Application of Liquid Manure in the neighbourhood of Manchester by the Liquid Manure Irrigation Company. With Supplementary Reports by Dr. MILLER, Mr. PHILIP HOLLAND, of Manchester, &c. Reprinted, with additions, from No. I. of the "Journal of Public Health." Price 2*d.*
2. The Application of the Refuse of Towns to the Purposes of Agriculture. Being an Account of an Experiment on the small scale with the Hose and Water-Cart, in applying the Drainage of a Large Establishment in the Country. By Dr. GUY. Price 2*d.*
3. The Hose compared with the Watering-Pot. Being a Report to the Directors of the Metropolitan Sewage Manure Company. By Dr. GUY. Price 2*d.*
4. Analysis of Evidence laid before the Health of Towns Commission and the Select Committee of the House of Commons, on Metropolitan Sewage Manure; together with Extracts from Works of Authority, showing the Value of the Refuse of Towns, and the Advantages in a Sanitary point of view of its Application in a Liquid Form to Agricultural Purposes. Edited by Dr. GUY. Third Edition. Price 1*s.*
5. Abstract of the Report of Messrs. BAILEY and GREIG on the Application of Sewer Water to the Gardens and Grounds in Fulham Fields. &c. &c. Price 1*d.*

6. Liquid Manure; its Value and Uses, and its Distribution by Machinery. By Dr. GUY. (*In Preparation.*)

LONDON: JAMES RIDGWAY, PICCADILLY;
AND
NISSEN AND PARKER, 43, MARK LANE.

Offices of the Company, 7, Waterloo Place.

ALEX. GREIG, *Secretary.*

REPORT

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DR. GUY AND MR. SHERBORN,

TO THE

DIRECTORS OF THE METROPOLITAN SEWAGE MANURE COMPANY,

On the application of Liquid Manure in the neighbourhood of Manchester, by the Liquid Manure Irrigation Company.

With Supplementary Reports,

BY DR. MILLER, MR. PHILIP HOLLAND OF MANCHESTER, &c.

Reprinted, with additions, from No. I. of the "Journal of Public Health."

GENTLEMEN,—In pursuance of the desire expressed by our colleagues in the Direction, we proceeded to Manchester on the 16th day of September, 1847, and on the following day had the satisfaction of witnessing the application of liquid manure by hose. We have also obtained much valuable information, which cannot fail of materially furthering the interests of the Company. For the materials of our Report, which has been carefully drawn up from notes taken on the spot, we have to acknowledge our obligations to the able superintendent of the works, Mr. Patterson, who, by the desire of Mr. P. H. Holland, of Manchester, gave us every possible facility for prosecuting our inquiries. We propose to divide our Report into three parts: 1st, a brief description of the operations witnessed by us; 2nd, a more minute account of the manure employed, and the degree of dilution practised, and of the several parts of the machinery by which it is applied; and 3rd, of a statement of its effects upon the land, founded partly on actual observation, and partly on the testimony of those who have employed it.

To the first two divisions your reporters have jointly attached their signatures. The third division, as properly belonging to the practical agriculturist, has the single signature of Mr. Sherborn.

1.—*Description of the Proceedings of Friday, September 17th.*

We first went to the Bridgewater Canal, to inspect the tank in which the liquid manure is collected and preserved for use, and having obtained much valuable information (presently to be detailed), embarked in a swift

canal boat for Lymm, fifteen miles from Manchester, where the application of the manure was to take place, and where we found everything in readiness. The apparatus consisted of a barge containing a pumping engine of eight-horse power, and a tank to hold the liquid manure, brought from Manchester; of a second carrying barge, containing an additional supply of manure; and of main and branch hoses of considerable length. The staff, in addition to the men employed in navigating the barges and working the engines, consists of a superintendent and six men. The piece of land which happened at the time to require irrigation, is a narrow, irregularly shaped meadow, of about four statute acres in extent, of which the right side is nearly straight, while the left forms at the further end a considerable curve. Its length is between 300 and 400 yards, and to the end of the curved portion, upwards of 400 yards. The canal at this point is raised about thirty feet, so that the hose, after being taken across the towing-path, had to be carried down a steep bank, and across a narrow road into the field. The first part of the operation consisted in attaching the main hose to the engine, in conveying into the field the main and branch hoses, divided into lengths of twenty and forty yards, placing them in the required positions, and coupling them. The main hose, which was carried through the centre of the field to about one-fourth of its length, terminated in a branch of smaller dimensions, continued in the same direction; a second branch, attached close to it, was carried to the right; and a third, joined to the main hose, about forty yards from its extremity, was carried to the left into the bulging portion of the field. From the barge to the extremity of this last-named branch was about 400 yards, or nearly a quarter of a mile. The three-branch hoses terminated in tin tubes, about two feet long and two inches in diameter, with spouts shaped like a fan, or the flattened rose of a watering pot, about four inches wide and the third of an inch deep. The hose and its branches having been arranged, the engine was set in motion, and in the course of a few minutes the liquid flowed from the tubes.

The application of the liquid was easily and expeditiously effected, one man guiding each tube, and another dragging the hose over the field. The men who guided the tubes scattered the liquid in a half circle from side to side, as if they had been sowing wheat, moving slowly backwards from spot to spot till the whole field had been irrigated. In order to enable the men to distribute the liquid with regularity, and not to leave any portion of the surface unirrigated, the field is marked out by small stakes, which guide the men in their work. This precaution is absolutely necessary when the grass is wet with rain. In dry weather it is not required; nor would it be required on arable land in regular stretches. The whole operation, though more than once interrupted by the traffic on the towing-path, and by other causes which it is not necessary to specify, occupied from a quarter past eleven, A.M., to a quarter past two, P.M., or exactly three hours, being three-quarters of an hour for each acre. The safety-valve of the forcing pump is loaded with 40lbs. on the square inch, being equal to a pressure of about eighty-nine feet, which pressure cannot therefore be exceeded with this apparatus, and is rarely attained. The liquid issued from the pipes in a full and uninterrupted jet, of from one to two yards in length. On this occasion, as the grass was already saturated with moisture, the liquid was applied in the proportion of one part of the manure and three parts of water, the quantity of the manure being three tons to the acre. In dry weather the same quantity of manure is diluted by more than six times its bulk of water. The arrangements for mixing the manure

with the water, and for measuring the quantity delivered, are so exclusively adapted to this particular mode of application, that your reporters do not deem it necessary to describe them.

2.—*Further details respecting the manure, and the mode of application.*

The manure employed by the Liquid Manure Irrigation Company is the more liquid part of night soil unmixed with other refuse matter, and as concentrated as it can be procured. It is brought to the store tanks on the banks of the canal in large water casks mounted on wheels, at an average cost of 3*s.* a ton. The price varies with the quality, which is determined by its specific gravity. The higher the specific gravity of the liquid, the higher the price given for it. It is absolutely necessary to apply some test, as attempts have been made to adulterate even this article of commerce. The manure is stored in uncovered tanks, and is therefore liable to be diluted by the rain which falls on its surface or drains into it. With a view to fix the ammonia, gypsum is added in the proportion of about half a hundred weight to from twenty to forty tons. The contents of the tank are transferred to the barges by means of a syphon.

The quantity of this liquid applied to an acre of ground is three tons, diluted, according to the state of the soil, with from three to six times its bulk of water.

The contents of the tank are by no means so offensive as might be expected, though covered with a scum, and emitting bubbles of gas; and the same remark applies to the liquid when transferred to the barge and shaken by the motion of the vessel.

When diluted with three times its bulk of water, as on the day on which we witnessed the application, the odour is very perceptible, but neither very offensive nor very enduring, and certainly much less offensive than that of many manures in common use. We are informed that it disappears in about three hours, and that cattle will eat the grass on the following day, or even on the same day. When diluted with six times its bulk of water, the smell is but very slightly perceptible half an hour after its application, and in no case is any annoyance occasioned to the neighbourhood.

The time required to irrigate an acre of ground, in the manner already described, is three quarters of an hour; but when the many causes of delay incident to this mode of application in its present state are taken into account, your reporters feel warranted in stating, that an acre of ground could be very effectually irrigated from the pipes proposed to be laid down by the "Metropolitan Sewage Manure Company" in half an hour at the outside, and that by a well organized and practised staff of six men and a superintendent, twenty acres, provided the fields to be manured lay contiguous to each other, might easily be irrigated in one day.

The cost of the application, on the supposition that the men receive 2*s.* 6*d.*, and the superintendent 5*s.* a day, and that the same number of acres were irrigated every day in the year, would amount to *one shilling* an acre; the cost would, of course, be increased, if the men, being permanently engaged, were only occasionally employed, or manured a smaller number than twenty acres.

The greatest distance from the source of supply, or, in other words, the greatest length of hose which has been at any time employed, is 970 yards, or 90 yards over half a mile.

The hose is made of the best canvas which can be procured, ("Navy

No. 1 Extra," 47 lbs to the bolt of 40 yards, 24 inches wide,) which, previous to being sewed, is saturated with a composition of the consistence of tar, and after being made up, is repeatedly coated with the same. Leather has been found too expensive, India-rubber has entirely failed, and double canvas is objected to, inasmuch as when any defect exists in the inner layer, the liquid gets between the two layers, and rots the hose. The hose is made into lengths of forty and twenty yards. The main hose, 300 yards in length, with joints at intervals of about forty yards for the attachment of the branch hoses, is about 4½ inches in diameter; the branch hose, of which 840 yards were in use on the 17th September, is about half the diameter.

The cost of the smaller hose is 1*s.* 3*d.* per yard, inclusive of fittings; that of the larger is more than twice that sum. When the canvas is of the best quality, and properly seasoned by the repeated application of the composition above referred to, it will last two years. This is the result of the experience of Mr. Patterson, prior to his undertaking the superintendence of the works of the "Liquid Manure Irrigation Company."

The hose now employed has been in use nine months, subject to a pressure of about eighty feet, and is still in good order. Holes are drawn together, and strongly darned, and those which are formed during the application of the manure are bandaged with canvas, and secured with rope, which answers pretty well as a temporary expedient. After every application, the hose is washed with water. There is no oozing of water, except where the canvas is defective, or where the joints are not properly secured. The liquid flows freely, and there is no deposit in the hose.

The charge for a single application of twenty tons to the acre is 1*l.*, and 6*d.* additional is charged for each mile the apparatus and manure have to be carried from Manchester. The charge at first was 10s. an acre, for ten tons per acre; but the same parties who originally paid that sum now willingly pay the higher price. Nor does the increased charge prevent the application, almost daily, of new customers. The application that we witnessed on the 17th was the second on that day, and we were informed that as many as fifteen acres have been manured on one day, but the quantity rarely exceeds ten. It is expected, however, that with improved apparatus, and especially with a more easily moved barge, the average daily performance will be 15 acres.

The wages paid to the men are 15*s.* a week, or 2*s.* 6*d.* a day.

With regard to the *frequency of the application*, there has not yet been time to collect much information, as the company has only been in operation nine months; in five instances the manure has been applied a second time.

The demand for the liquid manure is on the increase. Already three hundred acres have been manured for the Earl of Ellesmere and his tenants, and several hundred acres for other parties. As a financial operation, we have reason to believe, from the information afforded us, that it will prove eventually successful, but we have not thought it proper to enter into any particulars on that subject. A report of the operations of the company may shortly be looked for. The manure has been applied chiefly to grass land. It has also been used on garden ground with very marked effects, especially in the case of the more esculent vegetables.

Mr. Holland, under whose general direction, and the patronage of Lord Ellesmere, the affairs of the company have been conducted, reports that the results upon meadow land have been much less beneficial than they would have been had the farming of the district been in a more advanced position. Most of the fields which have been irrigated are very imperfectly drained,

and are crowded with weeds and with grasses of inferior quality. But even upon such land, not only has the quantity of grass been largely increased, but its quality has been very decidedly improved. Were these fields brought into a proper state of cultivation, the beneficial effects of liquid manure irrigation would doubtless be much more apparent. In this opinion Mr. Patterson, the superintendent, who has had great experience in the use of liquid manure, both on uncultivated and highly cultivated land, perfectly coincides.

Mr. Holland further expresses a very strong conviction, that if a conduit for the sewage of Manchester were constructed along the bank of the canal, as he suggested in his report, published by the Health-of-Towns Commission, for carrying out Mr. Chadwick's views in that district, such a conduit would form the best and cheapest source whence liquid manure could be obtained for distribution by such apparatus as he is now using. Indeed, the construction of such a sewage conduit, and the use of moveable engines and pumps for the distribution of the liquid manure it conveys, was the original idea from which the present undertaking originated; and the present operations may probably prove introductory to the original scheme, which is, in many respects, analogous to the intended operations of the Metropolitan Sewage Manure Company.

In one instance, a fair comparative experiment was made of the effect of liquid manure and guano. One hundred-weight of the Peruvian guano, dissolved in water, was substituted for a ton of the undiluted manure, and applied to a different part of the field. The superior effect of the liquid manure was pointed out by the proprietor of the ground, who was ignorant of the substitution.

The machinery of the company has been used for irrigation with water.

Your reporters are obliged to postpone some observations which they are desirous of making on the bearing of the facts they have collected on the plans and prospects of the "Metropolitan Sewage Manure Company," till the board shall have authorized an analysis of the liquid, of which they have taken care to secure a specimen.

(Signed) Francis Sherborn.
William A. Guy, M.D.

20th Sept. 1847.

3.—Mr. Sherborn's Report.

I visited Mr. Smith, a farmer at Barton, to whose land it was stated the manure had been applied with decided success. Mr. Smith was not at home, but would send a report to the office. I then went to Lord Ellesmere's, at Worsley, on whose estate three hundred acres had been manured. I saw Mr. Fletcher, the agent, who went over part of the land. There was one field of forty acres, one half of which was manured with liquid, the remainder in the usual way, with dung. The irrigated part was decidedly the best in colour, and Mr. Fletcher stated the crop of hay on the part treated with liquid manure, at the cost of 1*l.*, was quite equal to that grown on the part manured in the usual way, at a much larger expense, but the crop was not weighed.

I saw another piece of seventy acres that had been irrigated at 14*s.* 6*d.* per acre, being 10*s.* added to 4*s.* 6*d.* per acre, the place being nine miles distant from Manchester. An excellent crop of hay was mown; and a second application, after mowing, was made at 24*s.* 6*d.* per acre; the after-pasture is most abundant and most luxuriant.

I then visited the gardens where the liquid had been applied, and where all the vegetables were extraordinarily fine, but from the lateness of the season, I could not perceive much difference where the manure had been applied, all being good; but Mr. Mitchell, the head gardener, said, that after the application to asparagus, peas, beans, celery, and cabbages, the growth was quickened, and the produce larger; that there could be no doubt of its advantages for garden purposes, and he should continue to use it. This was confirmed by the under gardeners; but at this season of the year its effects are not so visible as to enable a stranger to determine its value for garden purposes; but the report of those who witnessed the application, and saw its effects, is perfectly satisfactory. The last observation will apply more or less to the grass lands.

I had no opportunity of witnessing its effects on arable land, nearly the whole of this district being in pasture.

FRANCIS SHERBORN.

4.—REPORT OF MR. SMITH.

Having had on the 21st and 22nd July, 1847, thirteen acres of grass land manured by the Manchester Irrigation Company with liquid, and having, by the request of Mr. Patterson, their manager, studied the result between those manured by him and that part that was not; and upon the former there was double the quantity, and of a much better quality. Also, there was some liquid fell upon the willows accidentally, and increased their growth a foot above the others. The result is so satisfactory to me, that I will apply it again when I can get it. Any one that doubts my statement, they are at liberty to call upon me, and I will show them the result.

J. SMITH.

Barton, Sept. 22, 1847.

[The following letter from Mr. Smith has been more recently received.]

Barton-on-Irwell, near Manchester, July 11th, 1848.

SIR,—I am in receipt of yours of the 29th ult., and beg to say that the result of irrigation on my farm was as follows:—On that portion irrigated there was at the rate of eight pounds of clover and other grasses per square yard, and on the unirrigated four pounds per square yard. The weights were taken in the month of May, after being twice irrigated. I cannot say what quantity of liquid was put on, as I left it altogether to Mr. Patterson, the company's superintendent, only there was double the quantity of produce, and of much better quality. I consider liquid manure far superior to any other manure that can be applied on the surface. By the use of liquid from my house and farm-yard, I mowed grass for my cows six times last year; and this year I have some grass ready to mow the third time, and I am now collecting liquid manure from the factories in the neighbourhood, being satisfied that it is the best and the cheapest that can be applied.

Yours respectfully,

JOHN GILBODY SMITH.

5.—DR. MILLER'S REPORT.

To the Chairman of the Board of Directors of the Metropolitan Sewage Manure Company.

SIR,—In conformity with the instructions I received from the Secretary to the Company on the 21st of September, I have analysed the specimen of

manure furnished through Dr. Guy, and which, I understand, is taken from the tank of the Manchester Liquid Manure Irrigation Company. The results of that analysis I beg now to lay before the Board of Directors.

The specimen was contained in a wine quart, was a turbid liquid of a brown colour, an offensive odour, partly feculent and partly sulphuretted.

By filtration, a light mucous sediment was separated, amounting in the imperial gallon to

26·4 grains.

Of this 18·4 were combustible.
8·0 fixed salts.

Upon evaporation, a brown residue was obtained from the filtered liquid, showing an amount of matters in solution of

460·00 grains per gallon.

Of this, 136·00 were combustible.
324·00 fixed salts.

With the combustible matter which burnt with flame, the ammonia was also dissipated.

The following table embodies the results of my analysis of the matter in solution; the solids in suspension were too small in quantity to allow of detailed examination.

	Per gallon.		Per ton.
Organic matters	103·12	...	23098·88
Ammonia	32·88	...	7365·12
Lime	14·33	...	3209·92
Magnesia	8·64	...	1935·36
Potash	21·76	...	4874·24
Phosphoric Acid	8·00	...	1792·00
Common Salt, Carbonic Acid, Sulphuric Acid, Sulphuretted Hydrogen	271·27	..	60764·48
	460·00		103040·00

Combustible . . . . . per gallon, 136; per ton, 30,464.
Fixed salts . . . . . per gallon, 324; per ton, 72,576.

For the sake of comparison, we will assume that the sample of the Manchester manure above described, and that from the King's Scholars Pond Sewer, on which I formerly reported as No. I., are fair average specimens.

Taking the three most valuable of their constituents, we find that in the two samples they bear very nearly the following proportion to each other:

	King's Scholars Pond.		Manchester Liquid Manure.
Ammonia	1	...	10
Potash	1	...	21
Phosphoric Acid	1	...	18

As the ammonia is by much the most valuable ingredient, we may employ it as a measure of the comparative value of the manure from the two sources. That of the Manchester Company will therefore possess a strength at least ten times as great as that furnished by the King's Scholars Pond Sewer.

If, therefore, three tons be required at Manchester for manuring an acre

of land—the quantity of liquid from the London sewer that would be requisite to effect the same purpose would be about thirty tons.

I have the honour to remain, your obedient servant,

WM. ALLEN MILLER, M.D., F.R.S.
Professor of Chemistry, King's College.

King's College, London, Oct. 1, 1847.

6.—*Supplementary Report by Dr. Guy and Mr. Sherborn.*

October 7, 1847.

Dr. Miller's analysis having been placed in the hands of the undersigned, they are now in a condition to complete their report of the 20th Sept.

That analysis appears to your reporters to have removed the only doubt which attached to the plans of the company, and to have placed beyond the possibility of cavil, the feasibility of applying the refuse of towns in a liquid form to the purposes of agriculture.

The doubt to which your reporters refer as having hitherto attached to the plans of the company, was as to the quantity of sewage manure which it might have been necessary to apply to the land. But the operations of the Manchester Liquid Manure Irrigation Company, by furnishing a standard of comparison, have given a satisfactory solution of the difficulty.

It appears that that company are in the habit of applying three tons of manure diluted with water to each acre of ground, at a charge of 1*l.* per acre, and 6*d.* a mile additional from the source of supply; and the evidence obtained of the excellent effect of the application and of the large and increasing demand existing for the manure, proves that the company is fully warranted in making that charge. Now, Dr. Miller's analysis shows that thirty tons of sewage will be a fair equivalent to the three tons of liquid applied by the Manchester Company.* It is therefore safe to infer that the Metropolitan Sewage Manure Company would be justified in charging 1*l.* per acre, and 6*d.* a mile for the distance from their station, for an application by hose of thirty tons of sewage. This would be at the rate of 8*d.* a ton, including the cost of application, and the wear and tear of hose. The price per ton would probably be diminished, if the quantity applied were increased; and it might also admit of material reduction if supplied by methods not entailing the labour required in the application by hose.

In supplying thirty tons of sewage to the acre, your reporters would suggest that the Metropolitan Sewage Manure Company will be giving more than an equivalent for the three tons of the Manchester Company, for the sewage submitted to analysis was that of a sewer (the King's Scholars Pond Sewer) which receives a large quantity of upland drainage, while the smaller sewers which will discharge themselves into the company's tunnelled sewer are supplied almost exclusively from the houses, and therefore discharge a richer sewage. Moreover, the specimen of sewage from the King's Scholars Pond Sewer, which Dr. Miller has made his standard of comparison, though corresponding closely with an average specimen examined by Mr. Brande, had less than half the strength of another average specimen examined by Dr. Miller, which was found to contain upwards of seven grains of ammonia to the gallon. It must also be borne in mind that before the company comes into operation, great extension will have been given to the house drainage, both by the growing sense of its importance and by the stringent operations of the Act recently

* It must be understood that the three tons here spoken of are undiluted manure, or what may be styled the mother liquor.

obtained by the Westminster commissioners of sewers. As the company will have the command of several sewers, and its servants will doubtless be strictly enjoined to admit into the tunnelled sewer only the more concentrated liquid, your reporters have every reason to believe that the suggested application of thirty tons to the acre will be more than an equivalent to the quantity of liquid manure used by the Manchester Company, and that the Metropolitan Sewage Manure Company may fairly charge 1*l.* per acre for each application, and 6*d.* a mile additional for every mile that the land to be manured is distant from the company's station.

Your reporters cannot conclude without congratulating the directors on the conclusive evidence afforded by the operations of the Manchester Company, of the practicability of every part of their own larger scheme, and on the light thus shed on the application of the refuse of towns generally to the purposes of agriculture.

(Signed) WILLIAM A. GUY,
FRANCIS SHERBORN.

October 17th, 1848.—The following interesting communication has been just received from Mr. Holland :—

At Worsley Park, some land, about twenty acres in extent, was three times dressed with liquid manure, in the spring of 1848, by the apparatus of the Manchester Liquid Manure Irrigation Company. The liquid was used in the proportion of three tons, largely diluted with water, per acre. Some adjoining land was top dressed with fourteen tons per acre of best stable manure, and a strip of about half-an-acre was left, for the purpose of comparison, without any manure whatever. The following is the weight of *fresh* grass and clover cut off each part of the same field, June 22nd.

Unmanured, produced	685	stone, 10 lbs.	per acre.
Solid Manure	880	„	„
Liquid Manure	1108	„	„
Excess of manured over unmanured . .	194	„ 4 lbs.	„
Excess of liquid over solid manured . .	228	„	„
Excess of liquid manured over unmanured	422	„ 4 lbs.	„

Shortly after this trial-cutting, rainy weather came on, and the grass grew rapidly. On July 5th it was all cut, and there was found—

On that manured with solid .	1034	stone,
On that manured with liquid.	1543	„
Excess	509	„ or, 3 tons, 3 cwt. 5 stone.

On a field belonging to Mr. Fletcher, of Reedings Hall, Timperley, the result of irrigating twice with liquid manure was to increase the produce of Italian rye grass and clover 50 per cent. The unmanured land left for comparison produced 1383 stone, while that irrigated produced 2074½ stone. The after-growth of the irrigated portion was decidedly the most luxuriant.

On a field belonging to Mr. Smith, of Barton, the unmanured portion produced 1380 stone of green Italian rye grass and clover, while that twice irrigated produced just twice the quantity. This crop was sold green at 1½*d.* per stone; the excess was, therefore, worth 8*l.* 12*s.* 6*d.*

The same quantity of manure was used in both cases, and the difference in the effect appears to have been caused by heavy rain, succeeded by frost, having almost immediately followed the first distribution of the manure on Mr. Fletcher's land, by which the effect of that application was greatly im-

paired. It might be expected that though liquid manure produces so much greater *temporary* effect than the same quantity of fertilizing matter in the solid form, that its permanent effect would be less. This does not, however, appear to be the case; for the apparent effect of the liquid which was last autumn applied to some land of Mr. Bannister's, of Stretford, on the crop of *this* year, is greater than it seemed to be last year. In all probability, the chief reason that manure in the liquid form produces a much greater effect than the same quantity of fertilizing matter undissolved is, that the great waste occasioned by the escape of gaseous matter into the air is avoided.

It is owing to the same circumstance that the annoyance given by liquid irrigation is as nothing compared with that produced by top-dressing. As is well known, a field heavily manured, with solid night-soil for instance, gives out offensive odours which may annoy the neighbourhood for days or even weeks. An equivalent quantity of liquid manure may be distributed without its being discovered even by the immediate neighbours: the smell will be scarcely perceptible upon the very land itself in a few hours, and in a day or two it is entirely gone; so rapidly is the manure absorbed by the soil and vegetation. The substitution of liquid for solid manuring will not only increase the value of the waste products of towns, but also remove one of the chief occasional annoyances of the country.

The following is a statement by Mr. Frederick M'Connel, on whose land near Altringham the effect of the liquid used by the Company was tried:—

"I have been much pleased with the effect the liquid manure has produced upon some land I have occupied during the last year. I consider the hay has been increased one-fourth; and its effect upon an orchard has been still more satisfactory, as I have had a most abundant crop of apples, pears, and particularly gooseberries and currants."

E. L. Lloyd, Esq., J.P., Oldfield Hall, near Altringham, had an old pasture field irrigated, which he considered the worst on his farm. The hay produced was very heavy, and was the best he had. He proposes to have all his mowing land irrigated next year.

Mr. John Mitchell, Lord Ellesmere's head gardener, writes, "that he has never seen any manure produce as good a crop of strawberries as the liquid has this year done at the Worsley Hall gardens. Manure," he says, "often causes a crop of strawberries to be lost, by forcing the growth of leaves. Liquid may be applied just when the plants are forming their flower buds, and the strength of the manure is spent in producing fruit, not leaves. When the plants were bearing, it could be seen to a plant how far the irrigation had extended."

The above are a few of the numerous instances in which the superior efficacy of liquid manure has been proved by the Manchester Company. The most convincing proof, however, is, that the demand for the services of the Company shows a steady and rapid increase. There is every prospect of the present operations of this Company forming the prelude to a scheme not essentially different to that of the Metropolitan Sewage Manure Company.

Such, indeed, was the original design of the promoters of the Manchester Company, to which they consider their present operations merely preliminary. Their ultimate design is, to have conduits constructed for the conveyance of the sewage of Manchester along the river Irwell and the canal, and to distribute this sewage upon the land by means similar to those they are at present employing. Should this design be carried into effect, there is little doubt of its being eminently successful and highly remunerative.

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Dr. Guy's Transparent Dispersing Ventilator.

This Invention combines the following important advantages:—it prevents Drafts; it does not obstruct the Light; may be made to assume a great variety of ornamental forms, so as to adapt it to any style of architecture; may be easily fixed, removed, and cleaned; and it arrests the larger particles of smoke and dust floating in the air of large towns. It is particularly recommended for Bed-rooms, especially such as are without chimneys; and for all close, hot, and confined Buildings and Apartments, where it is desired to avoid Drafts of Air.

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SMITH'S CHLORINE GAS GENERATOR—for producing a constant stream of Chlorine Gas for Disinfecting Purposes.

A Newly-invented and Cheap Liquid Manure Pump

That will disperse Liquid, by the power of one man, through a hose fifty to sixty yards in length, jetting the Fluid ten to fifteen feet high; it will also raise Water to the height of from thirty to forty feet. The Pump is portable, on a Stand, which, if required, could be supplied with Wheels, and is conveniently made for filling Carts, or emptying them, and spreading the Water or Manure at the same operation.

PATENT HOSE, of all Sizes, with Union Joints, Cocks, and Spreaders for Liquid Manure.

IRON LIQUID MANURE CARTS, at very reduced Prices, either with Iron or Patent Wooden Wheels.

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CLEANLINESS, AND FREEDOM FROM VERMIN.—The small quantity of bedding used is easily removed for airing, cleaning, or shaking. This is not so readily done with the heavy and cumbrous mattresses and palliasses now in use; and from the circumstance of the spring or elastic bottom being made entirely of iron, taken along with the readiness with which all the parts are got at, it will be found secure against vermin.

VENTILATION, AND SECURITY AGAINST CONTAGION.—Moreover, from its peculiar construction, the ventilation (or free access of air) to the under-side of the bedding carries off the perspiration, which otherwise remains and becomes condensed in the mattresses, &c. This supplies a considerable degree of security against contagion.

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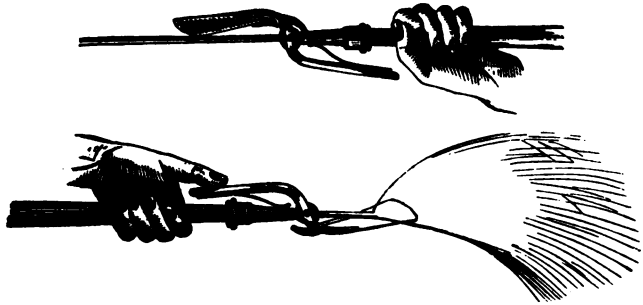

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THE necessity for screwing and unscrewing the Roses and Fans in ordinary use with Garden Engines, the liability of loss from their being detached, and the constant choking up from dirt, leaves, &c., has led to the invention of the registered "FIRE AND GARDEN ENGINE SPREADER," which combines all the useful effects of the Rose and Fan with the following advantages: it forms part of the Nose-pipe, which is in constant use; it can be thrown in and out of action instantaneously, at the will of the Gardener or Fireman; and stoppage by dirt or leaves is impossible. One Nose-pipe answering the purpose of three of the old construction.

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For the equal distribution of Liquid Manure on Garden Ground and Pasturage it is particularly recommended.

A large Assortment of Hydraulic Machines, Pumps, Garden and Fire Engines, always in Stock.

*** To be had at the Manufactory, and at all respectable Ironmongers in Town or Country.

PREPARED CANVASS HOSE FOR IRRIGATION.

MR. A. PATTERSON, Superintendent of the Manchester Liquid Manure Irrigation Company, can supply Hose for Irrigation, similar to that used by the Company, 2½ inches in diameter, at 1*s.* 3*d.* per Yard. This Hose, though so low in Price, is, with proper care, very serviceable, as three years' experience has amply proved.

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CHRIMES' PATENT FIRE COCK.

CHRIMES' PATENT FIRE COCK is introduced as a substitute for the ineffective Wood Plug, at present in use; it is also, under constant high pressure, a substitute for Fire Engines, as in cases of Fire it can be brought into almost instant operation, without that loss of time and waste of Water which the use of the Wood Plug involves.

It can be also expeditiously, cheaply, and most effectually applied to the watering and thorough cleansing of Streets, Courts, Alleys, Public Buildings, Windows, &c.; and, in Railway Stations, to almost every use for which a free supply of Water is required, including supplying Engine Tenders, cleansing Carriages, &c.

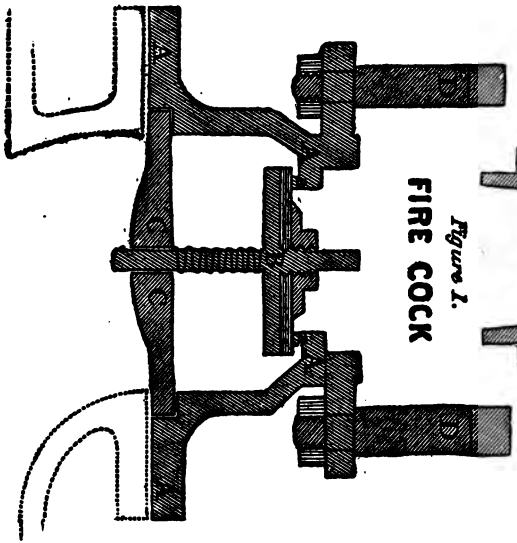

Figure 1.

FIRE COCK

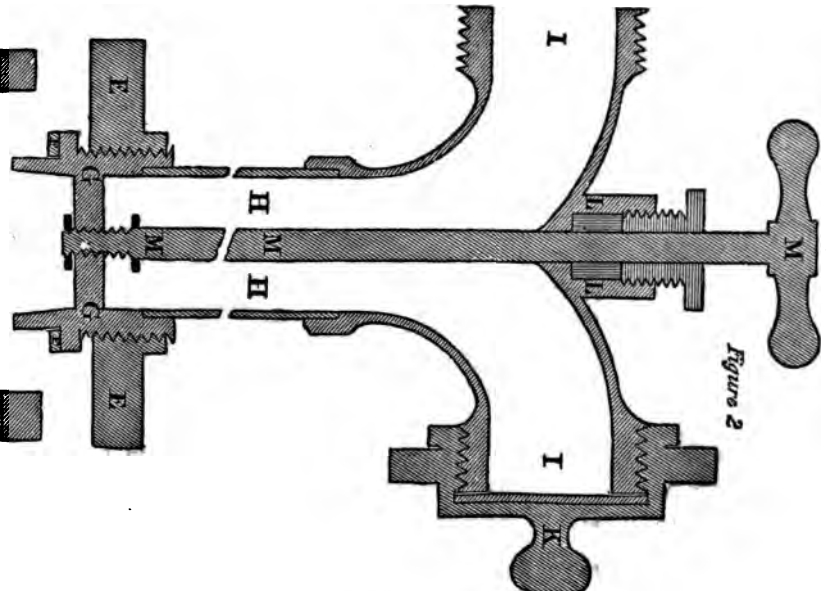

Figure 2

STAND PIPE,
For opening Fire Cock

It is also adapted for Watering Gardens and Pleasure Grounds, and by the application of suitable outlets, for Syringing Fruit Trees, &c.

THE PATENT FIRE COCK is especially adapted for high pressure supplies, as from the circumstance of the valve part of it being closed by the pressure of the Water, the higher such pressure becomes, the more is the tightness of the valve secured, and effectual safety from leakage ensured.

DESCRIPTION.

The PATENT FIRE COCK consists of a cast iron boss (A), with aperture of such size as may be required, and with flange for connecting it with corresponding flange on branch from Main Pipe, as represented by dotted lines under Fire Cock—the upper, inner edge (*a*) of the boss being raised and faced, forms a valve seat, a loose valve (B) covered with leather, the spindle of which works in a brass bridge (C), and which, when not in use, is always closed. To the boss are attached wrought-iron inverted ell-shaped lugs (D), to which the Stand Pipe, (afterwards described,) when the Fire Cock is brought into use, is secured.

When the Fire Cock is required to be brought into operation, it is done by the application of a Stand Pipe, (Figure 2,) which, and the mode of its application, may be described as follows:—

The STAND PIPE consists of a copper or iron tube (H), the upper part of which forms brass discharge pipes (I), with screwed ends for hose, having at one or either end a brass screw cap (K), at the diverging of the discharge pipes, is the stuffing box (L). The bottom part of the Stand Pipe forms a brass male screw (G), with leather washer (F), working through a brass female screwed collar (E). The collar has projecting lugs, which passing under lugs (D) of the Fire Cock, firmly secure them to each other, and form a connexion of the Stand Pipe with the Fire Cock, which is perfectly water-tight.

Passing down the Stand Pipe, through the stuffing box (L), is a wrought-iron rod, with brass crutch handle at top, and a male screw at bottom, working through brass female screw at bridge (G), and by turning the crutch handle of which, more or less, the valve of the Fire Cock is gradually opened, the flow of water controlled, and concussion in the pipes entirely prevented; while, at the same time, the sudden strain on leather, or other hose which may be attached, is to a very great extent diminished.

The PATENT FIRE COCK, which, from the above description, will be seen (especially under high pressure) to be of universal adoption, may be safely stated to be cheap, simple, safe, effective, and durable. It can be managed readily by any person who has seen it once used. The screw insures a perfect control over, and regulated supply of, water, preventing damage, either to the hose or pipes, by sudden rush or recoil; and above all, the instrument can be instantly and effectively brought into operation, without any loss of time involved in turning the water off and on in the mains, usually the case under the old system.

From these important considerations it is believed that Water Companies, Insurance Companies, and other Corporate bodies, and that Noblemen, Gentlemen, Merchants, and Manufacturers generally, will avail themselves of an invention at once so efficient and practical, and by the use of which, as far as relates only to danger and loss from fire, so much security can be so easily and effectually obtained.

With regard to another almost paramountly important object—that of Cleansing Streets, Thoroughfares, Courts, Alleys, &c.—it will be sufficient to say, that the PATENT FIRE PLUG was tested at Sheffield, by desire of WM. LEE, Esq., Civil Engineer, who says—"The Patentees have this morning, (Feb. 21st, 1848,) at my request, in the presence of the Mayor, the Town Regent, and many other influential persons, applied their machine to the cleansing of one of our most public thoroughfares, and I am glad to say, with the most perfect success. A length of public carriage-way, from Twenty to Twenty-four feet wide, and 150 yards in length, was washed as clean almost as a house-floor in five minutes."

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30	1 4 1	1 6 1	2 10 4
40	1 10 4	1 13 6	3 3 8
50	2 3 10	2 13 11	4 7 3
55	3 0 4	3 13 3	5 5 0
60	4 2 3	5 1 3	6 7 2
65	5 16 3	6 19 11	7 16 9

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30	0 18 5	0 19 6	2 2 10
40	1 2 8	1 4 10	2 18 7

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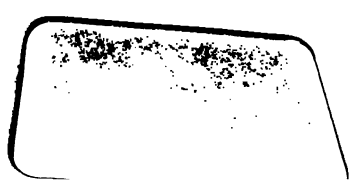
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